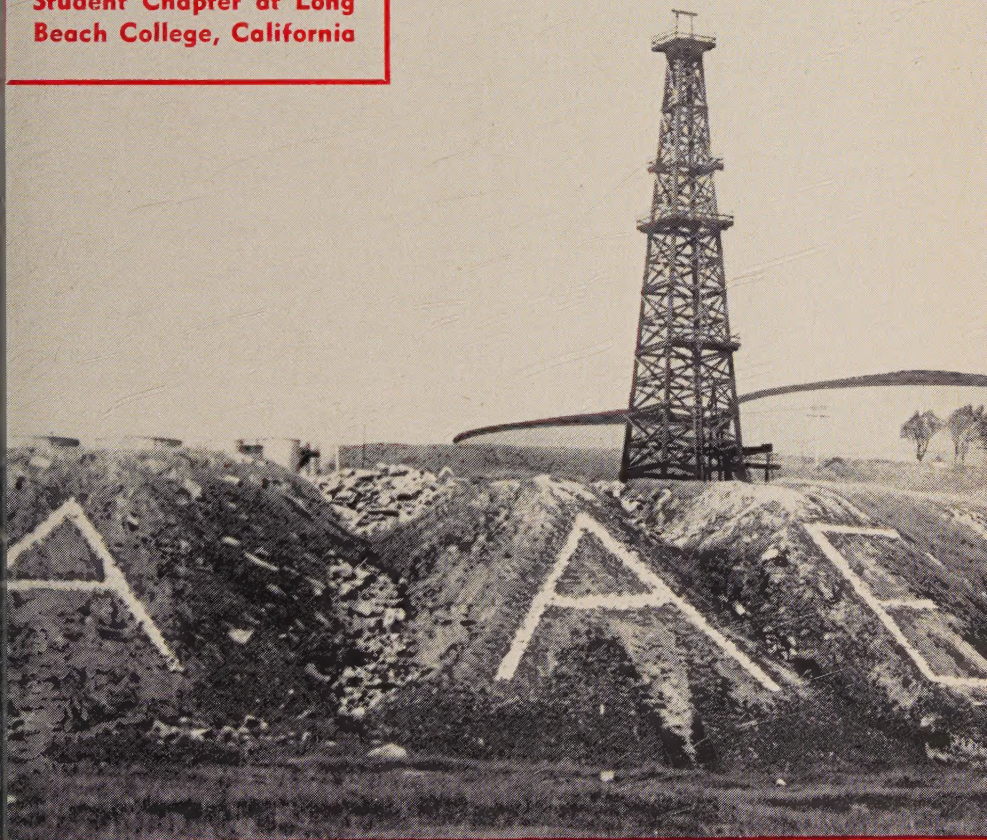


PROFESSIONAL ENGINEER

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September, 1948—Vol. 33-No. 3

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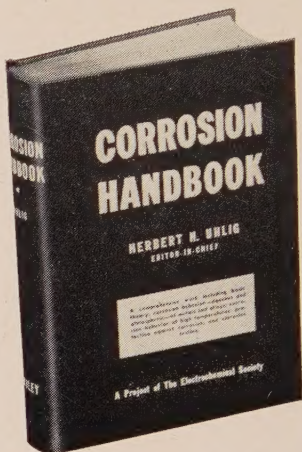
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PROFESSIONAL ENGINEER

"The Voice of the Engineer"



Published Quarterly by

The American Association of Engineers

8 South Michigan Avenue, Chicago 3, Ill.

Volume 33

SEPTEMBER 30, 1948

Number 3

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1948-1949

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Table of Contents

	Page
President's Message—Why Do Turtles Stick Their Necks Out?.....	2
There's Human Engineering, Too!.....	3
<i>By James M. Orr</i>	
A.A.E. Heartily Endorses New Project of Profes- sor Jelinek.....	9
Women in Engineering.....	10
Your City and Its Building Code.....	12
<i>By Walter H. Scales</i>	
Development Plans of India.....	15
<i>By Y. D. Kumor</i>	
Plan for Comprehensive Security Training.....	17
New Haven A.A.E. Student Chapter Former.....	18
Our Profession—Extracts from a Paper by Dr. D. B. Steinman.....	22
Bakersfield Student A.A.E. Chapter Formed.....	24
Grand Dad Bill.....	26
Book Reviews.....	29

M. E. McIVER, Editor

American Association of Engineers assumes no responsibility for statements made or opinions expressed by contributors of articles published in *Professional Engineer*.

Entered as second-class matter May 5, 1933, at the Post Office at Chicago, Illinois, under the Act of March 3, 1879. Acceptance for mailing at the special rate of postage provided for in section 1103, Act of October, 1917, authorized August 9, 1918. Subscription price, U. S., \$1.00 a year; Canada, \$1.50; foreign, \$2.00. Printed in U.S.A.

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Why

DO TURTLES STICK THEIR NECKS OUT?

A Message to Young Engineers and Engineers In Training

EVEN the turtle would not get anywhere unless he stuck his neck out.

We have been sticking our necks out quite frequently during the past decade, with various forms of success.

Sometimes we had our ears pinned back, and at other times we had the satisfaction of witnessing young engineers prepare themselves for the position in the community that would eventually place them at the top of their profession.

They started Student Chapters of A.A.E. in the various engineering schools and took active parts in all school and civic activities.

Upon completion of their schooling, they advanced to regular membership and also continued their interest in civic and professional affairs.

They made good, so why don't you?

Don't build castles in the air, based upon the claims of the various organizations that have sprung up in recent years.

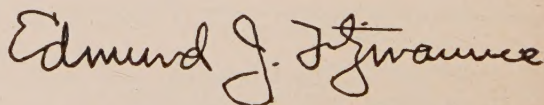
Many have tried to copy A.A.E.'s principles, in part, but just as there is only one STERLING in silver, there is likewise only one A.A.E. in Engineering.

The original may be copied, but it cannot be replaced.

Let us have Student Chapters of A.A.E. in every engineering school in the United States, and we will have a nucleus of engineers who will bring additional credit to the long line of laurels credited to A.A.E. during its thirty odd years of existence.

Any young engineer who is willing to work for the social and economic welfare of the engineering profession is bound to be a better citizen as well as a better engineer.

Good luck, and God bless you all!



President, American Association of Engineers

THERE'S HUMAN ENGINEERING, *Too!**

By JAMES M. ORR,

Director of Student Personnel New Haven Y.M.C.A. Junior College

JAMES M. ORR, Director,
Student Personnel, New Haven YMCA Junior College

IT IS rather remarkable that I should be asked to participate in the program on the occasion of the granting of the charter to this engineering organization. It is remarkable because I am certainly a fish out of water among a group of engineers. I have never studied engineering subjects. I have never been employed as an engineer. I never studied mathematics above the level of college algebra. I have studied no college physics. And as for the material involved in such courses as Mechanics, Strength of Materials, Mechanics of Machinery, A.C. Circuits, etc., they are Greek to me. When students ask what certain engineering courses contain, I am forced to say, "I am not an engineer. All I know is what the College catalogue says about the course. Let us look at it." Whereupon I open the catalogue, read the course description, and in most cases remain just as ignorant as I was before. So, you see why I think it rather remarkable that I should be asked to talk to this group on this occasion. But a person naturally assumes, if he is asked to speak, that he is probably expected to speak about something

*A speech given June 17, 1948, on the occasion of the presentation of the charter of the New Haven Y.M.C.A. Junior College student chapter of the American Association of Engineers.

which he knows. And, as you all know, my interest is in psychology, vocational guidance, and counseling. But, realizing that as an engineering society you are not interested in my field except as it may be related to yours, I am going to attempt to establish some degree of relationship.

My topic, *There's Human Engineering, Too* sounds a bit defensive. It sounds as though I am interested in pointing out that technological engineering is not the only phase of engineering—that the technical man cannot overlook human relations. And that is just exactly what I want to emphasize. I do not wish to minimize the tremendous importance of the engineering profession (for it is a tremendously important profession and one which has created most of the material progress that has been made in our era) but I do want this evening to ask that the engineering profession return the compliment, and ask it not to minimize the importance of human engineering.

It seems to me, as well as to competent authorities, that we must give increased attention to the latter. We are living in an era when technological developments have resulted in such efficient production that the material well-being of men is probably at its highest peak in history. But technological developments have also created goods capable of destroying the very men and nations who created them. Progress in the physical sciences, of which engineering is the major application, is far in advance of progress in psychological science, of which clinical and industrial psychology are some of the applications. The lag in human engineering behind technological engineering is tremendous, and in the minds of many, this lag contains the dynamite that could result in the destruction of our civilization.

Our era is one of specialization. The advancement of knowledge in each area has been so great and so rapid that, of necessity, each of us is forced to devote so much time to our specialties that we find it difficult, if not impossible, to keep even slightly abreast of other areas of knowledge and activity. But the complexity of today's world makes it imperative that none of us isolate himself in his own little field. To do so is only to increase the complexity of the problems of our society. It behooves us, therefore, to attempt to become acquainted with advancements in areas of knowledge other than our own, to realize the impact of the advancement in one field upon that in another field.

Respect for Other Specialists

Granting the impossibility of our becoming expert in many fields does not relieve us of at least two responsibilities, however. These are:

first, to accept the fact that advancements *are* being made in fields other than our own, and

second, to accept the findings and conclusions of the specialists in those other fields, and grant them the right to speak authoritatively in their fields just as we have in our field.

A psychologist would not presume to speak authoritatively about an electrical engineering problem, and the engineer should not presume to



Organizing officers of the Engineering Society of the New Haven YMCA Junior College, which was presented with a student chapter charter just before school closed last spring. (Reading from left to right, standing) B. J. Cox, program committee chairman; Nils Hanson, membership committee; Edward Magee, vice-chairman; Edward S. Olsen, treasurer; James Lyons, Jr., membership committee; George Houston, program committee; (seated) James Ajello, program committee; Leon Taylor, chairman membership committee; James J. Boyle, Jr., Chairman, and Raymond E. Bellmore, Secretary. Under the leadership of these undergraduates and graduates in engineering at the College, the society grew from a membership of less than twenty to more than 100 in seven months.

speak authoritatively about a problem in human relations. But the latter is too frequently the case.

It is in the area of human relations, human engineering, or psychology, (call it what you will) that we find the greatest reluctance on the part of people generally to accept the findings and conclusions of "experts". One reason for this is that we are all practicing human relations daily, and we, therefore, feel that common sense based on our individual experience is sufficient. All of us are much closer to the applications of psychology than we are, let us say, to the applications of mechanics. Those of us who are not sophisticated regarding the scientific and technological aspects of mechanics probably never would rely on our own "common sense" to try to solve a problem. We would consult an engineer. But all too frequently, those of us who are specialists in other fields insist that we can handle human relations expertly. We do not recognize the fact that there is already a large body of specialized knowledge in that field, too.

If people in general are reluctant, engineers and physical scientists are more reluctant either to look to the findings of psychology, or to accept psychological facts and principles when they do look at them. I should like

for a few minutes to speculate regarding the reasons for this antipathy.

There are two possible reasons why engineers and physical scientists tend to overlook or to reject the findings of psychology. In the first place the psychological make-up of the engineer is quite different from that of the psychologist. The two breeds are inherently different in many respects. In the second place the materials with which the two sciences deal differ radically, and as a consequence their conclusions are expressed with different degrees of exactness.

Physical and Social Sciences

First, look at the make-up of the two groups, engineers and psychologists. Both groups require a very high order of general intelligence. Only the brightest people are likely to succeed in either field. (And when I speak of general intelligence, I mean the kind of intelligence that is required to get the education necessary for either field.) But, although the groups are alike in total intelligence, the *components* which make up this total general intelligence *differ* to a rather marked degree between the two groups.

On the one hand, the engineer requires an exceptional amount of native capacity for quantitative thinking—thinking in terms of numbers and symbols. On the other hand, the psychologist, while requiring a high order of quantitative thinking ability, requires, especially, an exceptionally high degree of so-called verbal ability—the ability to think in terms of word concepts and of abstract ideas of a non-quantitative sort. The engineer, possessing the quantitative type of mind which deals with exactness such as is illustrated by such a concept as “ 4° ” or a “ 45° angle,” becomes irritated and impatient with the psychologist. The psychologist must express even his quantitative concepts through inexact quantitative terms, such as are illustrated by the term “IQ of 100”, and when called upon to define in exact term what he means simply cannot do so, because the term itself is inexact.

Here then is one basic difference in their make-up: one needs quantitative ability to the greater degree, while the other needs linguistic or verbal ability to a greater degree.

Another difference that seems to be more or less inherent between the two groups is that, on the one hand, the engineer must have the ability to perceive the size, shape, and relationship of *objects in space*, as is illustrated by geometric figures, and by two-dimensional representations of three dimensional objects on a drawing. In other words, he has the native aptitude to visualize in concrete terms of size, shape, and dimension. But the psychologist needs relatively little of this ability. Instead he has to deal with ideas which cannot be represented graphically, which do not possess form, shape, or size, as is illustrated by such terms as emotion, intelligence, perception, neurosis. When the engineer or physical scientist, endowed with a concrete type of mind (and I do not mean a mind of cement!) looks

at the literature of the psychologist who has the more abstract type of mind, he is irritated, confused and rebellious. The two differ so much in this native aptitude that it is difficult for them to get together intellectually.

A third difference between individuals engaged in the two professions lies in the ability to see relationships. The engineer establishes the relationship between tangible things such as gears, cams, beams, *etc.*, all of which are, or may be, organized in logical, coherent, concrete relationships. But the psychologist is concerned with establishing the relationship between concepts, or between processes, which cannot be visualized, and which cannot be measured in any exact way. An illustration of this is his attempt to establish the relative importance of intelligence, aptitudes, personality, environment, and past experience when trying to advise on vocational choice. None of these factors is at present exactly quantifiable, and certainly none of them possesses form, mass, or shape. Again, the engineer is irritated, simply because his mental make-up rebels against the kind of abstractions that must, by the very nature of psychology, be employed in describing relationships.

Another factor that makes it difficult for the two groups to think alike and to accept each other's findings lies in the background of interest of the two groups. Characteristically, the engineer has been interested in things, objects, materials, and numbers. The psychologist, however, has more characteristically been interested in people, their activities and their relationships. Where the engineer liked mathematics and the physical sciences in high school, the psychologist probably liked history, literature and the biological sciences. So they bring different backgrounds of interest with them making it difficult for them to see each other's findings in the proper perspective. (Perhaps the fact that a smaller percentage of our engineering students than other students participate each year in elections for student government is a reflection of this basic difference.)

Finally, personality differences, broadly speaking, may be said to separate the two groups in their thinking. In general, the engineer is more likely to be a lone worker, meditative, retiring, thoughtful, introvert, and individualistic. The applied psychologist (not the researcher) is more likely to be gregarious, and to have a fundamental interest in people rather than in things. I see, then, these several differences in the make-up of the two groups: quantitative vs. verbal ability; perception of form vs. conceptualization of ideas without form; concrete relationship vs. abstract relationships; interest in things vs. interest in people. I have exaggerated the differences purposely for the sake of emphasis. No one engineer and no one psychologist would be likely to fit neatly into the pattern as I have shown him here. They will vary considerably, and the nature of the specialized work within their field will vary with their interests and abilities. Nevertheless, it is my opinion that much of the gulf which exists between the two groups of scientists may be attributed to these differences.

Now, if each group will recognize these differences, it will be more

tolerant of the findings of the other, will allow the other to speak with authority for his field, and will accept his statements. Unfortunately, the problem seems more acute when asking the physical scientists to accept the social scientists than it does when expecting the social scientists to accept the physical scientists.

This may be due, in part, to the fact that the physical scientist can present concrete evidence of his work, and because the history of the physical sciences is so much longer that they have a "tradition of acceptance" which psychology has not yet achieved. The social sciences, including psychology, in this year of 1948 are in only slightly better position than the physical sciences were in the days of Galileo and Newton. If you remember, there was resistance to their findings in their day, too.

Now that we have examined some differences in the psychological make-up of the two groups of scientists, let us look at differences in the materials with which the two groups deal. The materials of the physical sciences, being physical rather than physiological or social, lend themselves to study under exactly controlled conditions. The physical scientist can weigh, measure, analyze, take apart and put together his materials; he can subject them to changing conditions of temperature or pressure, and if the materials are destroyed in the process, they can be replaced by new ones. If a machine does not work properly the engineer can take it apart, examine each part, correct the fault, put it together again and it will work. The machine has no feelings about this process, no attitudes about it, and does not die when tampered with.

But, the psychologist and other social scientists are dealing with a living, human organism, which operates in an amazingly complex way, being influenced by its own physical condition, by the inter-relationship between its mind and body, by the attitudes of others around it, by the physical and social environment in which it lives, and even by its attitude toward itself. It cannot be dissected without danger of permanent impairment; it cannot be subjected to laboratory tests that may permanently alter it; its characteristics and properties cannot be studied in isolation. There is no such thing as intelligence or emotion in isolation. It is difficult for an engineer to appreciate these essential differences in materials and the consequent differences in approach to their study.

This profound difference in the materials of the two sciences makes it impossible and ill-advised for these two sciences to use exactly similar methods or to seek equally exact conclusions. This factor must be recognized by those who become impatient with the work of the psychologist or other social scientists. The engineer must learn not to expect from the psychologist the same degree of exactness or finality of conclusion that are possible in his science. We would hope, as he recognizes this, that he would stop evaluating our work in terms of his own, and let us evaluate ours within the limits imposed upon us by the complexity and integrity of the human being.

(Turn to page 20)

A.A.E. Heartily Endorses New Project

Professor Jelinek of Missouri School of Mines asks cooperation of A.A.E. in compilation of an "anthology on professional problems" for the use of Engineering English Students.

ALONG with the writing and analyzing of technical reports, advanced students in Professor James J. Jelinek's course in Engineering English at the Missouri School of Mines and Metallurgy have for a number of years studied and analyzed articles on professional, as distinguished from technical, problems and prepared theses on such problems. Professor Jelinek discovered that students know little of the practical world in which they must earn a living, little of the business problems which will confront them in actual practice. He has become convinced that the schools are under obligation to awaken the interest of students in professional problems and to give them a survey course, in connection with Engineering English, that will encourage them to read and enable them to grasp the full significance of articles dealing with professional problems as they are presented from time to time in engineering journals.

To show the scope of professional problems, and to give students a basic understanding of the major types, Professor Jelinek plans to collect the clearest and most forceful expositions of such problems as those which arise in connection with registration, ethics, employment, civic responsibilities, compensation, government work, public relations and education. He is asking many organizations to cooperate, submitting those articles which seem best adapted to his needs. Professor Jelinek is confident that a publisher can be found who will be tremendously interested in the project. Correspondence with deans of engineering and professors of Engineering English has convinced him that a book of this kind will be gladly received by educators and that it will be used widely as a reference book in English courses for engineering students. American Association of Engineers considers the project so constructive and so logical that it wonders why the project was not initiated long ago. Educators have always contended that the curriculum is now overcrowded and that no time can be allotted to a course in professional problems although they admit that students should be fortified by some knowledge of the business problems they will encounter in actual practice. Professor Jelinek has shown how professional problems can be covered without encroaching upon the time allotted to basic technical subjects. He deserves the thanks and the cooperation of all engineering societies.

Joe Butler is Dean of Engineering at Rolla School of Mines, and an active member of A.A.E.

Women IN ENGINEERING

WARM and spontaneous applause sounded in the fieldhouse at the University of Colorado commencement exercises when four women, in company with three hundred men, received degrees in the varied technical fields of engineering. For, although the modern emancipated woman has stepped into nearly every professional field formerly dominated by men, the woman engineer is still a rarity.

But rare as she may be, the woman engineer has scaled the ladder of success in her chosen profession with dignity and determination. The record of thirty-one women who have graduated from the College of Engineering at the University of Colorado since 1903 shouts with proof of feminine fortitude and ability. From the first lone pioneer, Minette E. Frankeberger, who was the only woman engineer to graduate between 1903-1919, to this year's outstanding graduate, Phyllis Ann Fox, the list is starred with exceptional achievements.

C.U.'s feminine pursuers of engineering knowledge are acknowledged by professors, male colleagues, and employers to be "as good as any man." The only real difficulty they encounter now in breaking into the field is the same problem that faces women entering any other career—the probability of getting married and abandoning their work. However, the woman engineer has met that problem unusually well. Nearly every one of C.U.'s graduates married, or plans to marry, an engineer. So, whether married to an engineering career, to an engineer, or combining the two—as many of them have done—they have stayed in the orbit of engineering.

The question of why women choose the arduous trail of learning which is necessary to become qualified engineers brings the same answer that it would if put to women in any other field. Possessed of mathematical minds, dextrous hands, and curiosity and interest in "how things work," they follow their most natural means of expression. Just as a woman interested in art or music finds enjoyment and satisfaction in aesthetic creation, so a practical woman does in the technicalities of mechanics, aerodynamics, architecture, chemistry, or electronics.

"Probably because they are so few, our women students usually maintain a higher grade average than the men," says Dean C. L. Eckel of the college of engineering.

An outstanding indicator of scholastic ability is Miss Phyllis Ann Fox, a June graduate with special honors, who is the first woman engineer from C.U. to be awarded a graduate scholarship at Massachusetts Institute of Technology. Honored by two national engineering honorary fraternities, she is overwhelmingly admired by male fellow-students.

In 1945, because there were so few engineering coeds on campus (about thirty each quarter), and because those few were scattered through several



The University of Colorado coeds get set up for surveying on campus.
Barbara Ann Bird, Dallas, Tex., (left) watches as Colleen Connell (Boulder), adjusts the transit.

departments, the girls began to feel a need to band together. That year, the Delta chapter of the Society of Women Architects and Engineers was organized on the C.U. campus. It functions now as one of four such chapters in the country.

When the years of grueling study and laboratory work are finished and the degree is won, the woman engineer goes on to a shining career. Because she has seriously undertaken a difficult profession, she has already proved her ability in the classroom and has little difficulty in finding a position.

C.U.'s first woman engineer, the late Minette Ethelina Frankeberger, set the pattern for her followers.

Later graduates followed the pattern set by these beginners, winning scholastic honors and going on to successful careers. "One in a million," and "a corking good engineer" say employers and professors of Virginia Sink, project engineer at the Chrysler Institute, where she teaches 700 men and women the mysteries of chemistry. Virginia was a graduate of the class of 1936.

The 1948 graduates will go on to emphasize again the proof that a woman can be more than "a heck of an engineer."

Your City AND ITS BUILDING CODE*

By **WALTER H. SCALES**, Past President, A.A.E.

SUNDAY magazine and business periodicals, the daily and technical press, the columnists, the radio commentators, and the movies—all are vying for public attention on the subject of Building Codes. Governmental agencies and some trade groups are lifting their voices in the popular theme song. The clamor has become so great that many municipal officials have come to the conclusion that their communities are going downhill and will become “hick towns” unless they get on the handwagon. Dorothy Dix tells the women-folk to buy a new hat and get a real lift and a better outlook on life when things are not up to par. Similarly, a lot of people have the idea that adopting a new building code, or revising an old one will bring a community out of the doldrums of building, housing, and employment. Let us get rid of that fallacy and study a few facts based on experience. The good effects of a building code are always slowly accumulative; there is nothing magic about it; it is not a hypo “shot in the arm”.

What, then, are some of the advantages and disadvantages of building codes? What should we seek and what avoid? To be a good code it must be equitable; fair for all materials and constructions; free from provisions which mandatorily prohibit or prevent the legitimate use of any material, and flexible enough to admit of all proper uses. The code must provide safety to life and property consistent with the occupancy or use of a property. Most important of all, a good code must be properly administered. Given such a foundation, a building code can and will curb jerry-building, help to stabilize local construction practices and standards, and this in turn will be a real factor in stabilizing property values. It can and will assist in improving local fire and insurance conditions—but only slowly as old and deficient structures are replaced by new ones of greater efficiency and safety, or are modernized. But, if the code does not meet these qualifications, or is not properly administered, it can and will become a millstone around the community's neck and retard progress, create discriminations that give temporary advantages but result in ultimate retarding of building programs, and will tend to make the municipality the unpaid, but always on-the-job salesman for some favored material or type of construction.

If your city has an old and not enforced code, or no code at all, it is certain that the adoption of a *good* new code will increase building costs somewhat; but a poor code or poor administration will increase costs more and throw your building economics out of balance.

*Text of an address to the Annual Meeting of the Florida League of Municipalities at Miami Beach, Florida, by W. H. Scales of New Orleans, La., Architectural Engineer & Building Code Consultant of the National Lumber Manufacturers Association.

Enforcement is the greatest single factor for good or evil in the regulation of building in your city. Just as a good cook can make a delicious meal with ordinary foods while a poor cook ruins the finest of foods, so can a good enforcing officer get some surprisingly good results out of a most ordinary code, while the most carefully drawn ordinance will be of little or no benefit to the community in the hands of an easy going, or incompetent building official. "Favoritism" and "politics" are common under a poor building code, but indifferent enforcement of any code, be it good or bad, invites such evils. In many cities poor enforcement must be laid to the fact that both the code and its enforcement constitute the real "orphan child" of the city. The Building Inspector is the official who interprets and applies your code; he should be qualified, adequately paid, and supplied with such assistants and facilities as are necessary to do the job right. It is poor economy for a city to stint the quality of its building inspection. If you cannot afford proper enforcement of a code, you have no business adopting one.

You can adopt a new code just as fast as you can push it through your Council or Commission under your Charter provisions. But making a "rush" job of adopting a code is just asking for trouble. You would not think of signing a contract to control all the building funds your children and grandchildren and their descendants are likely to possess in the next 100 years, without giving it the most serious study. But that, in effect, is exactly what you propose to do if you rush through a building code; worse yet, you do that to your entire community, not just to your own family. Would you sign a contract without knowing its contents or how it will affect you? Yet that is what some city officials do when they fail to properly study a proposed building code. No code, not even a poor one, can be made or studied over night. *Take time and do the job right*; the old adage, "Haste Makes Waste," is especially applicable to building regulations. You can repeal or amend an unsatisfactory regulation, but you cannot rebate the dollars or undesired features built into structures because of it. As a Mayor or Councilman or Commissioner or member of a Code Committee, you have an economic, as well as a safety responsibility to your fellow citizens.

Building codes may be custom-made or ready-made, like your clothes. Custom-tailoring may give you a nice fit and cost you more in time and money; but you can also get a good fit by means of a few alterations of a ready-made ordinance. Like suits, there are several models from which you can select. You may take the first one shown to you, but it is usually more satisfactory to look over the stock before you buy; if you don't, you may later find that you passed up a pattern that you would like better. And also, as in selecting a suit, remember that a building code is intended for hard everyday wear and for a long time and is not a full-dress garment just for special events.

In making your choice, don't gauge the standards and performance

of the modern code or building by the obsolete laws and structures of the past; but at the same time don't let your enthusiasm for progress and a desire to be up-to-date blind you to the fact that experience is the great teacher and the basis for true comparisons. For example: The safety, durability, and economy of the Ordinary Brick-Joisted business or apartment building built under a modern code cannot be judged or rated on the basis of the old style structure of a similar type which is often justly termed a fire-trap; the records prove this to be an incontrovertible fact, but some would make such erroneous comparisons. On the other hand, some officials fear that they will be ridiculed and be dubbed "old-fashioned" and "behind the times" if they do not immediately approve and even grant privileged status to some new material or type of construction just because it is ballyhooed as being "new", "modern", and "an improvement". While no city should refuse to recognize or approve meritorious improvements in building, it should not permit itself to be stampeded into accepting mere "claims"—it should demand adequate proof of all claims.

Here's another vexing problem: The police powers of a municipality are broad but they are often stretched beyond reason where the municipality endeavors to control the appearance or minimum building values of a community by building code regulations. Desirable as it may seem, it is neither practical nor legal to enforce aesthetic or cost requirements that are subject only to deed restrictions. Closely akin to this phase of regulation is zoning; *building codes and zoning ordinances complement each other but they do not implement each other*. It is often advantageous to administer both ordinances under the same official and publish them in the same book, but it is courting trouble to put both in the same Ordinance or mix building code requirements in a zoning ordinance or vice versa. The same thing is true of other related codes and ordinances, such as Plumbing, Electrical, Elevator, etc.—keep them separate.

To be satisfactory and successful, your Building Code must have the approval and support of the public. While you or your local Code Committee are making up your minds as to what you want, it is most wise to let your constituents know what you are doing. This is especially true if you have had no code heretofore, or if there has been little or no enforcement of what you did have, or if your old code has been unpopular. No matter how good a code you may adopt, there are going to be those who will raise the inevitable "squawk" about its being drastic and arbitrary and raising costs unnecessarily; and in spite of all that you do they may have some justification. You can enhance acceptance and gain support from the beginning by avoiding all semblance of rushing a code through or of keeping it under cover and in the hands of a few. The building code is not class legislation; it affects everybody.

Up-to-date building regulations would be more prevalent in your state if the methods of adopting a new code or amending an old code for

building, plumbing, electrical work, etc., were not so cumbersome and expensive. The answer is simple: legalized adoption by reference and limited publication requirements. Your League can easily help to rectify the situation by obtaining the necessary enabling Acts from the Legislature. When this is done, building codes will cease to be projects about which municipal officials hesitate to do anything because of cost and difficulties.

To summarize; a building code can be of great importance to and have beneficent effect on the welfare and development of your city; whether that importance and effect are for good or bad depends on the conscientious care with which the code is drawn and enforced.

DEVELOPMENT PLANS OF *India*

By Y. D. KUMAR,

Member of A.A.E., and Roads Organization, Ministry of Transport

WITH the transfer of power from British to Indian hands, our country is busy with numerous development plans for rapid industrialization and uplift of the standard of living of the masses. Lack of enough technical experts and plants are the chief bottlenecks. A number of planning committees have been set up; their recommendations are partly translated into action and partly are in the planning stage. Some of the activities are given below:—

1. Land Reclamation Schemes on “grow more food campaigns,” etc., to meet food deficit.

There are 2 to 3 million acres of land out of cultivation. At present reclamation of 10,000 acres in Khurai Saugor District of Central Provinces with 2 units of 15 American tractors is in progress. We need more and more tractors to complete the programme.

2. Multipurpose Schemes.

A Central Design Organization is under the Central Waterpower Irrigation and Navigation Commission (CWINC) is engaged in investigations of a number of multipurpose projects such as, Mahanadi, Narbada, Tapte, Indravati, Assam Valley, and Bhakra Dams.

Trainees are being sent to U.S.A. and the countries for specialized training in methods of design and construction of dams and hydro electric installations.

An International Commission on Irrigation and Canal is also proposed to be set up with Central Office in this country.

If we seek the rapid development of our natural resources, we will have to import foreign expert personnel and capital equipment on an extensive scale. We have already foreign experts like Mr. Savage and others in India. Two American experts are exploring the possibilities of

development of Tubewells in U.P. and East Punjab.

Our total installed capacity of electrical power in 1936 was about 900,000 K.W., in 1946, it increased to about 1.4 mil. K.W. Out of our total capacity of 1.4 mil. K.W. in 1946, 8,80,000 K.W. was thermal power and 494,000 hydel power. We have plans for expansion of this capacity by another 600,000 K.W. by 1950 and another 2.3 mil. K.W. by 1955, an increase of 170% in next 7 or 8 years.

Our total planned capacity of 3.7 mil. K.W. will constitute hardly 10% of our water power potential which is in the neighborhood of 30/40 mil. K.W. The Damodar, Mahanadi and Kosi projects are well under way. There are others which are also under consideration.

Some of the features of the principal irrigation projects in hand are given below:

Damodar Valley: Comprises 8 dams on the Damodar river, will provide flood control irrigation for 10,000,000 acres of land and will provide electric power—3,000,000 K.W. for Behar and Bengal. Cost about 55 crores.

Teesta Project: Dam at the Coronation bridge will be 700 ft. high and impound 3,500,000 acre ft. of water and generate 500,000 K.W. energy.

Kosi Valley: Drainage area 23,800 sq. miles. Dam 750 ft. high (higher than Boulder dam) cost 100 crores—power available 1.8 mil. K.W.

Orisso—Mahanadi Valley: Dam $3\frac{1}{2}$ miles long, height 125 ft., and will irrigate 11,000,000 acres of land and supply power of 300,000 K.W. There will be 3 other dams with gross storage of about 23 mil. acre ft. and will supply power 1 mil. K.W.

Madras: Tungbhadra (Kistna) in progress. Dam 82 ft. long, 160 ft., storage 2.6 mil. acre ft. and will irrigate 300,000 acres of land.

Ramapada—Sager Dam across Godavari—Dam 400 ft. high. Power available 150,000 K.W., will impound 15 mil. acre ft. of water.

United Provinces: Nayar Dam (Tributory of Ganges)—600 ft. high will cost 15 crores and supply 100,000 K.W. energy. Riband Dam on Sone—250 ft. high, storage 9 mil. acre ft., cost 6 crores.

Punjab: Bhakra (Sutlej)—480 ft. high—storage 3.5 mil. acre ft. will supply 660 cusecs of water and supply power 1.6 lakh K.W. and so on.

National Highways: In addition to above schemes. Yet another and no less important scheme in execution is the development of National Highways and other roads in India. The scheme (known as the Nagpur Plan) envisages development of 22,000 miles of N.H. at a cost of 47 crores and 3000 miles of National Trails at a cost of 3 crores.

Provincial Highways, 65,000 miles costing.....	121 crores
Major Dist. Roads, 60,000 miles costing.....	62 crores
Other Dist. Roads, 100,000 miles costing.....	80 crores
Village Roads, 150,000 miles costing.....	30 crores
War Arrears	10 crores
Bridging	45 crores
Land acquisition	50 crores

In agricultural area, no village will be more than 5 miles from a main road and the average distance will be less than 2 miles generally and in non-agricultural areas no village will be more than 20 miles from a main road.

Following figures give the picture of the plan before partition of the country.

<i>Roads</i>	<i>Existing miles</i>	<i>After completion of programme</i>
Concrete surface	570	20,000 miles
Bituminous types	14,566	54,000
Metalled surfaces	79,936	126,000
Unsurfaced	203,249	20,000
Professionally aligned:	298,321	400,000

Bridges: Some 100 major bridges are to be constructed ranging from 1500 ft. to 2 miles length—for instance:

Some at Delhi—2 miles long.

Ganga at Mokumah Bihar—12 miles long.

Brahmaputra—1 mile long.

Gandnati Godavari—1 mile long and so on.

Central Govt. has assumed liability of 14,000 miles of N.H. after partition.

Plan

FOR COMPREHENSIVE SECURITY TRAINING

Drafted by the National Defense Committee of the Union League Club of Chicago, and presented to the House of Representatives, 80th Congress, by Representative Church of Illinois.

COLONEL WALTER R. JEFFREY, Reserve Officer, industrial engineer, and member of American Association of Engineers, was chairman of the Union League Club's national Defense Committee which presented to Congress a very comprehensive plan for national defense, differentiated for three distinct situations, as follows:

Plan P, training for citizenship in peace and preparedness against war; plan ANE, anticipation of national emergency; and plan W, the national emergency of war.

In general Plan P envisages balancing the military defense with civilian defense, with coordination at the Presidential level for the two in conjunction with Federal and State governments and the national economy. It further contemplates decentralization to state control of all civilian defense

activities and of the citizens military training camps on a similar basis to the National Guard in peacetime and during periods of anticipation of a national emergency. Plan ANE, recognizing the need for compulsory training in emergency periods, still insists that the United States must avoid the ruthless disregard of human rights which characterizes conscription in totalitarian states.

The entire program would be financed on a national level but administered on a state and local level, causing a minimum of dislocations in our society and economy, the committee says. The memorandum is supplemented by charts and graphs covering practical details. In this fine piece of civic service, the Union League Club of Chicago lives up to its charter object: "To defend and protect the integrity and perpetuity of this Nation."

New Haven Student Chapter

LAST year a group of 12 engineering students in the graduating class of 1947 of the New Haven YMCA Junior College, of New Haven, Conn., decided to meet several times each month to "keep up" with engineering developments and to study the field together. This month (June) the



Pictured at the presentation of a national charter to the New Haven YMCA Junior College Engineering Society, student chapter, are (left to right), Raymond E. Bellmore, newly elected president of the student group; James J. Boyle, outgoing president who accepted the charter; Edmund J. Fitzmaurice, national president, A.A.E., who made the presentation, and Dr. Walter R. Hibbard, Jr., faculty advisor to the group and Chairman of the Engineering Division of the College, which operates independently in Yale University.



Edmund J. Fitzmaurice (standing) national president, A.A.E., is pictured at a dinner meeting of the New Haven YMCA Junior College Engineering Society during which he presented a chapter charter to the student group.

New Haven YMCA Junior College Engineering Society, with a membership of over 100 graduates and undergraduates of the College, looks forward to a profitable second year under its new designation, Student Chapter of the American Association of Engineers.

The Charter was presented to the group of students by Edmund J. Fitzmaurice, national president, at a special dinner meeting at the close of the spring session on June 17. With Fitzmaurice, speakers at the occasion were Dr. Walter R. Hibbard, Jr., faculty advisor to the group, and James M. Orr, Director of Student Personnel at the College. New officers were elected and enthusiastic plans laid for what is to be a new beginning for the group, for affiliation with the national association has been their goal since the society's inception seven months ago. This reached, they can look forward to greater progress.

Progress is perhaps the keynote of the young chapter. The original alumni membership found its association so profitable that it suggested the society be open to all engineering students at the College. Dr. Hibbard, Chairman of the Engineering Division at the College, and Assistant Professor of Metallurgy at Yale University, was chosen their faculty advisor, and officers were elected after the first organization meeting. Because membership was limited to alumni in engineering and to "fully matriculated engineering students"—those who have completed the calculus course or their first two years in engineering, allowances were made in the Constitution to permit all engineering students to participate

as associate members until membership requirements have been completed. Meetings have included group discussions on the engineering field and allied topics as well as guest lectures by prominent engineers throughout the New Haven industrial area.

As a chapter of the American Association of Engineers, the New Haven college group plans to gain an even larger membership, a closer association with engineering developments, and a more profitable relationship within its own group and among engineers throughout the national organization.

There's Human Engineering, Too!

(Continued from page 8)

The Scientific Method

I have dealt much too long on differences at the sacrifice of pointing out similarities. There are similarities. The similarities exist in the application

Both fields rely on observation and experimentation as the source of their laws and principles. Galileo observed the swinging chandelier while attending church and formulated an hypothesis as to why it swung. This in turn led him to drop weights experimentally from the Tower of Pisa. Out of this came the formulation of the law of falling bodies. Freud, observing the mentally ill, formulated an hypothesis that mental breakdown frequently was the result of the conflict between basic instinctual drives within an individual and the demands made upon him by his environment. His observations and those of his successors tend to confirm this principle. But, the principle can be tested experimentally only on animals. To experiment on human beings is too dangerous.

Animal experiments tend to bear out Freud's hypothesis as applied to animal behavior. Data on human behavior must be obtained largely from case histories and observations. Unlike the law of falling bodies, though, the principle of conflicting drives cannot be reduced to a mathematical representation. Because it cannot, there are those who reject it. A physical *law* lends itself to exactness of expression; a psychological *principle* does not. This must not lead us to reject the latter, however, or we will overlook much that will be useful to us in our daily contacts and problems.

The social sciences owe the physical sciences a debt for their contribution of the *scientific method*. The social sciences are just as rigorous in attempting to apply it as are the physical scientists. Both formulate their problem; both collect all the data available (or create methods of obtaining the data) which will help in formulating a tentative conclusion or hypothesis; both evaluate the hypothesis in the light of all the available evidence and data, or continue to observe or experiment until the hypothesis is rejected or accepted; both then put their findings to the test for final verification. Both are sciences, in this respect. But the younger, newer science of psychology is forced, in addition, to devise new methods of obtaining its data, new

methods of measuring its materials. Its technique lacks the refinements which have been inherited by the workers in the physical sciences. Despite these limitations, it has found much that is sufficiently valid, in terms of *understanding* human behavior, of *predicting* human behavior and of *controlling* human behavior, to merit respect and to warrant study of its findings by people outside its field who can apply the findings.

It is interesting to observe, in this respect, that the basic problem of the psychologist—that of always seeing each person as a whole and observing the inter-relationship among all aspects of his make-up—is increasingly becoming the problem of the physical scientists. Just as the psychologist, for example, is faced with the mind-body dilemma, the physical scientist is faced with the energy-matter dilemma. Perhaps our research problems are becoming more alike as the physical scientists push further into unknown realms.

An Appeal

I ask that you, as engineers, attempt to accept the fact of a science of human engineering (immature though it may be) ; that you overcome your natural tendency to reject or ridicule the science; that you recognize that skill in technical engineering does not guarantee skill in human engineering; and that either you become acquainted with the basic principles of psychology or consult with those who are specialists in that field when you are faced with psychological problems. You are, and will be faced with such problems—all of us are. Even the isolated engineer must work with colleagues—a psychological problem; he must be able to influence his superior to accept the design on which he has worked for months—a psychological problem; he wants a raise—getting it is a psychological problem; he frequently is advanced to management responsibilities where his major function is the handling of people (for the machinery, technically perfect though it may be, is dependent on human operation if it is to produce)—a psychological problem. The problems of supervision, of morale within the organization, of social relationships among workers and between management and workers are psychological problems.

The selection of persons of different capacities and abilities for different kinds of work is a psychological problem. Public relations is a psychological problem. Actually one's personal effectiveness as a technical engineer may itself be impaired by his own psychological problems. And if none of these exist the engineer certainly has psychological problems, problems in human engineering if you will, in rearing his family and in getting along with his wife. So the engineer or physical scientist, to a greater or lesser degree, like all of the rest of us, is confronted daily with problems in human relations.

You all recognize these problems. My plea, since you recognize them, is that you make it your business to become familiar with the psychological principles on which to base your handling of them; that you overcome your tendency to rely only on personal experience. If Galileo, Newton, Boyle,

Charles, *et al* had felt the same way about relying on "common sense", there would not be the engineering profession that there is today.

I do not ask that you become professional psychologists. Rather I ask that you become acquainted with the principles they have found, for the guidance that they can give you. At least, become "ham" psychologists. The "ham" radio operator has to know the fundamental principles of radio. You must have the fundamental principles and concepts of human engineering, yes—even to function as a technological engineer.

You, the engineer, have been responsible for the tremendous advances in our physical well-being. Now you must give some attention to our psychological well-being or the forces you have discovered may destroy us all.

Our Profession*

Dr. D. B. STEINMAN, Life Member and Past President of A.A.E.

THERE have come down to us, through the centuries, the immortal words of Lord Bacon:

"Every man is a debtor to his Profession."

We want to make these words more than a mere phrase—we want to make them part of our working lives.

As we are benefiting by the Profession's heritage from the great Engineers who labored in the past, we want to augment that heritage before passing it on to those who are to follow us.

Our inheritance is two-fold:

On the one hand, it consists of that vast store of scientific and technical knowledge that has been built up by the researches, inventions and discoveries of past generations of Scientists and Engineers. That is our technical heritage.

On the other hand, our inheritance consists of the public standing, confidence, and esteem, that have been won for our Profession by the character and achievements of the Engineers who labored before us. It consists of the high professional traditions they have handed down to us to cherish and foster. It consists of the ideals of service and the high standards of professional honor upon which the public regard for our Profession is founded. All these things constitute our professional heritage.

To discharge our indebtedness to our technical heritage, we have our technical societies. Those older organizations were founded for the advancement of the science of engineering . . .

To discharge our indebtedness to our professional heritage, we have

*Almost twenty years ago, Dr. Steinman wrote this exposition of the aims and activities of American Association of Engineers, emphasizing the fact that the organization was founded to deal with the "human side of engineering." It is republished because of its interesting analogous relationship to the article by Mr. Orr in this issue. Inasmuch as A.A.E. has never swerved from its first principles, the statements made by Dr. Steinman are as true today as when they were written.

the American Association of Engineers, founded in 1915 for the advancement of the non-technical interests of the Profession. This association is consecrated to fostering the ideals and the traditions of the Engineering Profession, to stimulating public service within the Profession, to guarding high standards of professional honor, and to conserving and strengthening public confidence and esteem.

Through membership and active participation in this organization, the individual Engineer renders his contribution toward making Engineering a better Profession than he found it.

THE AMERICAN ASSOCIATION OF ENGINEERS

The American Association of Engineers came into existence in response to a definite need—a need for a nation-wide organization devoted to the common interests of all Engineers; a need for an organization devoted to the *human* side of the Engineering Profession; a need for an organization devoted to fostering unity, mutual consideration, and fraternal co-operation within the Profession; a need for an organization uniting Engineers of all sections of the country, of all branches of the Profession, of all ranks, of all ages, in a common cause; a need for an organization devoted to fostering professional consciousness, pride in the Profession, and recognition of individual obligation; a need for an organization interested in advancing the social and economic welfare of the individual Engineer; a need for an organization devoted to fostering the highest standards of professional honor and to making the established ethical standards part of the working life of Engineers; a need for an organization to represent all branches of the Profession in public relations activities; a need for an organization devoted to concerted effort for the advancement of the Profession in public recognition and esteem.

The American Association of Engineers is the only national organization devoted to the human side of the Engineering Profession. Its purpose is to bring Engineers together in a professional brotherhood—in mutual understanding, helpfulness, and cooperation. The advancement of this purpose alone is ample justification for the continued existence and growth of the Association.

Thousands of Engineers throughout the United States are banded together in this organization. We are uniting our efforts to make pleasanter the relations and working conditions within the Profession. We are seeking to relieve the Engineer of economic pressure so that his best energies may be free for his high service to civilization and human progress.

We are striving, through organized effort and publicity, to secure for the Engineering Profession its rightful place in public esteem, and for the members of that Profession more adequate recognition and recompense for their services to society.

A PROGRAM OF SERVICE

To attain these fundamental objectives, a broad-visioned, well-balanced program of Association activities must be logically developed, persistently

adhered to, and energetically carried out. Such program, like any program for real accomplishment, must be predicated on the foundation principle of service. In our case it must comprise:

1. Service to the Public
2. Service to the Profession
3. Service to the Individual Engineer



Director Pecos H. Calahan presented an A.A.E. Student Chapter Charter to Les Sanford, President, Bakersfield Calif., College Chapter on May 24, 1948.

Bakersfield Student Chapter

National Director Pecos H. Calahan, who presented to Bakersfield Student Chapter its A.A.E. charter, reports that this was a gala occasion. The ceremonies were held in the school's "outdoor lounge"; wives and fiancées of chapter members acted as hostesses and served refreshments. Mr. Calahan read to the group a letter from Edmund J. Fitzmaurice, president of the Association, and discussed the opportunities for

professional development that are inherent in student chapters. Others appearing on the program were: Miss Grace Bird, director of Bakersfield College; Carl Stutzman, president of the college student body; Asa Meudell, president of the Metropolitan Bakersfield Engineers Club; and Al Miller, treasurer of the student group. Les Sanford, chapter president, was in charge of arrangements for the meeting.

Long Beach Junior

On the cover of this issue of PROFESSIONAL ENGINEER is a graphic report of the special activities of Long Beach Student Chapter. This is an aerial ground marker built by chapter members; it required eight hours work from each of 40 students. The lines which form the letters are about a yard wide and are raised eight inches above the ground. To make the letters, concrete was broken and placed in stepped trenches on the side of the hill and then whitewashed to increase visibility. Begun as an initiation stunt, the project so intrigued the Chapter that old members joined the pledges to complete it.

An even more ambitious project is in the making. The Chapter would like to construct its own club house, and will do so if several knotty legal problems can be solved.

Most enjoyable of the Chapter's field trips this year was that which gave the group an opportunity to visit the plant of the Davis Car Co. at Van Nuys, California, and see its radically new three-wheel car in action.

New officers are Bob Kilpatrick, president; Dave Lyons, vice president; Bob Bennett, recording secretary; Jim Moor, treasurer; and Norman Johnson, corresponding secretary.

Long Beach

Demonstrating awareness of A.A.E.'s aim to "stimulate public service in the profession" Long Beach Chapter devoted one meeting to a consideration of the subject "Problems Facing the Schools." The speaker was Dr. Adams of the Long Beach Public School System. Scheduled for the June meeting is colored motion picture on coaxial cable installation, presented by a representative of the Associated Telephone Company. This is the type of cable used for transmission of high frequency telephone, radio, and television signals. After the June meeting, the chapter recessed until September.

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Riverside Officers

S. A. Keen, Jr., is the president of the lively little A.A.E. group at Riverside College (California), and Lewis Techenor is vice president. Ray Ables serves as secretary and Allen McCollum, as treasurer. Charles Ciamowski is sergeant-at-arms. A. J. Twogood is the club sponsor.

Arizona State College A.A.E. Chapter

The Arizona students have organized for the 1948-1949 year and ready to start chapter activities under the leadership of S. C. Dodd, president; Earl Nelson, vice president; William A. Thomasson, treasurer and Everett H. Cook, Secretary.

Bits of



Wisdom

The attitude of many of our exalted politicians seems to be, "when conditions become confused, let me at least make sure that I get something for myself."

• • •

Only Rational Thoughts or utterance have value either to ourselves or others.

The only thoughts that are rational are those related to some definite use.

Honest to God uses are those that concern the neighbor rather than ourselves.

• • •

We actually profit by serving others.

• • •

Some forty years ago the secretary of a very large corporation told me that his directors' meetings seldom lasted more than twenty minutes. His method was to state the problem explicitly and then make the obvious solution clear.

• • •

Mr. Atlee has said, "When big business gets too powerful so that it becomes monopolistic, we hold that it is not safe to leave it in private hands." Is it not time to realize that we can cut a dog's tail off without killing the dog? This particular dog is one of our outstanding assets.

Grand Dad Bill

A. A. E. Member, Authority on Interior Design

Mrs. E. Jean Blanc Miller, will be the speaker at the October 13th meeting of the Chicago Branch, American Association of University Women. Mrs. Miller is a member of the faculty, Northwestern University, Chicago campus, where she teaches interior design. She is a designer in her own right, specializing in the design of furniture and household products.

Brauns Goes to Nisswa

Nissawa, Minn., is now the postoffice address of Vernon T. Brauns, member No. 1019, of the American Association of Engineers. Mr. Brauns will be remembered by a host of Chicago A.A.E. members because of the many fine social events he put on for Chicago Chapter. He has always been interested in Association activities, although during the past few years he has devoted most of his time to his own business, The Progress Press. Mr. Brauns is combining business with pleasure these days.

San Bernardino

A ham dinner will all the trimmings was the feature of the October 12th meeting of the San Bernardino Chapter held at the Derby House, in Colton, Calif. The subject of the meeting was Sewage Disposal and Mr. C. H. Holland, district representative of General Electric Company was the guest speaker. The November meeting will be held in Redlands on November 9th, and the December meeting will be in Riverside on December 14th. City group chairmen are B. W. Shaw, Riverside, Barry Dibble, Redlands, R. W. Getchall, Fontana, and Don Bergelis, San Bernardino.

Association Ballots

The meeting of the Board of Directors, A.A.E., will not be held until December this year, and therefore ballots will not be mailed to members until late in October or early in November.

East Central Junior College

Word comes from Richard McMullen, Secretary of the A.A.E. Chapter at East Central Junior College, Decatur, Miss., that the boys are starting off in good fashion and hope to have a banner year.

The group is going to try and create greater interest in its club and in the Association's program throughout the year. Why not give the boys encouragement by writing them a letter, setting forth a few objectives for them. Every member of A.A.E. should be sincerely interested in student engineers—the engineers of tomorrow.

Peoria Chapter

The Peoria Chapter, A.A.E., has elected the following members to serve as officers and directors for the ensuing year: President, W. R. Sipfle; Vice President, C. G. Saville; Secretary-Treasurer, Vernon F. Barr; Directors, Nesbitt L. Woods, Wain Wallace and A. R. Halvorson.

All engineers in the vicinity of Peoria are invited to join the Association and the Chapter. Under the leadership of President Sipfle, the year promises to be most successful.

President Sipfle took "time out" from his regular duties recently to pay a visit to National Headquarters. We wish that every member of the Association who has occasion to be in Chicago would call on us. Interchange of ideas is always helpful.

Chaffey Junior Chapter

The Engineers at Chaffey have started their fall activities under the leadership of Arthur E. Flum, their sponsor and their new officers. Bob Waid is the president; Bill Higby, vice president; Charles Macion, recording secretary and David Nittie corresponding secretary. Robert Adler will serve as treasurer and Eugene Reher will be responsible for field trips.

The boys expect to make a record this year. Here's good wishes and lots of luck to all of them.

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Book Reviews

Fundamentals of Electric Waves, second Edition, 1948. Hugh Hildreth Skilling, Ph. D. Professor of Electrical Engineering, Stanford University. John Wiley & Sons, Inc. \$4.00.

Greatly revised and much new material has been added. The chapter on antennas has been rewritten and enlarged. A very readable textbook containing a number of tables and some well selected references.

Introduction to Highway Engineering, Fifth edition, 1948. John H. Bateman, Professor of Civil Engineering Louisiana State University. John Wiley & Sons, Inc. \$5.50.

The author brought this book completely up to date by revising text matter, tables and appendixes. Many new illustrations have been added covering new developments. The author is an outstanding authority on highway engineering and since the book has reached the fifth edition little more need be added.

Farm Soils, their Management and Fertilization, Fourth Edition, 1948. Edmund L. Worthen, M.S. Professor Emeritus of Soil Technology Cornell University. John Wiley & Sons, Inc. \$3.20.

A member of the Wiley Farm Series this book should be of great value to Agriculturists being outstanding for its clarity and common sense approach. Farmers should make this book a "must."

Modern Methods of Home Heating, J. L. Shank, Consulting Engineer. Simmons-Boardman Publishing Co. \$1.00.

This is a reprint from "American Builder" together with an introductory chapter by S. Konzo, Professor of Mechanical Engineering, University of Illinois. All types of home heating are fully

described and considerable space is devoted to radiant heating. A handy book to have around even for the layman. The book lacks in one detail in that it does not treat heat pumps.

Outlines of Physical Chemistry. Farrington Daniels, Professor of Chemistry, University of Wisconsin. 1948. \$5.00. John Wiley & Sons, Inc.

A book with a history having been originally started by Dr. Getman of the University of Wisconsin in 1913 under the title, *Outlines of Theoretical Chemistry*. The book underwent many revisions which added greatly to its value. An exceptionally well written book—clear-concise and with a look to the future of physical chemistry. A good book in every respect.

Engineering Contracts and Specifications. 1948. Robert W. Abbett, M.S., C.E. Consulting Engineer. John Wiley & Sons, Inc. \$3.75.

This second edition is a "must" for contractors, engineers and business Executives. The author knows his law and his engineering since nothing has been overlooked, there is even a chapter on construction insurance. There are three chapters on specifications. This book can be considered the bible of the construction industry.

Introduction to Applied Mathematics, 1948, Francis D. Murnaghan, Ph. D. Professor of applied mathematics the Johns Hopkins University. John Wiley & Sons, Inc. \$5.00.

This is the first book in the new Wiley Mathematics Series and it makes a good beginning. The book covers mathematics used in physics and engineering and covers the field thoroughly; vector and matrix calculus, harmonic analysis, spherical harmonics and Bessel functions. Chapter 10; The Operational Cal-

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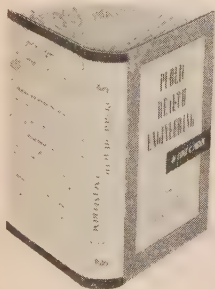
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culus is especially noteworthy. A book no engineer can afford to be without.

Public Health Engineering, Vol. 1, 1948, Earle B. Phelps, Professor of Sanitary Science University of Florida, Professor Emeritus of Sanitary Science Columbia University. John Wiley & Sons, Inc. \$7.50.

Written primarily for the engineer engaged in the designing and construction of sanitary plants of all kinds. The book is different in that it stresses the public health rather than engineering all of which makes the book valuable to City Officials, City Managers, etc. The author has had wide and varied experience in this field, this together with the fact that the author writes exceptionally well, makes this book a real contribution to contemporary literature.

Engineer Materials, Second Edition, 1948, Alfred H. White, Professor Emeritus of Chemical Engineering, University of Michigan. McGraw-Hill Book Co. \$6.00.

This book has been completely re-

vised mainly due to the fact that the war brought out many new materials and considerable improvement on old materials. There are several new chapters on wood, plywood, etc. Chapters on alloy steels and light metals have been rewritten. Plastics, laminates, etc., are well covered. The book is a bonanza for information and almost made to order for engineers.

Atomic Energy, 1948, Karl K. Darrow, Ph. D., Bell Telephone Laboratories. John Wiley & Sons, Inc. \$2.00.

One of the best books on a rather difficult subject being a story of the basic facts most pertinent to the transformation of energy of rest mass into energy of motion and energy of heat, which really means atomic energy. The book is really four lectures delivered at Northwestern University being the Norman Wait Harris Lectures. A fascinating book by a competent authority. A book that every educated person ought to have in his library.

Forest Protection, second edition, 1948, Ralph C. Hawley, Morris K. Jesup, Professor Silviculture, Yale University and Paul W. Stickel, Assistant Professor of Forestry, University of Massachusetts. John Wiley & Sons, Inc. \$4.50.

A well written textbook covering all phases of forest protection. The book contains 20 chapters and an appendix, the latter lists common and scientific names of all tree species mentioned in the text. There is also a separate listing of plant diseases and insects harmful to forests. While this book is intended primarily for students it will also prove very helpful to foresters.

Simplified Design of Structural Timber, 1948, Harry Parker, M.S. Professor of Architectural Construction, School of Fine Arts, University of Pennsylvania. John Wiley & Sons, Inc. \$3.25.

A good book for builders and architects but so written that it can readily be used by non-technical workers such as craftsmen, etc. The design procedure is up-to-date in every way. Forty-five

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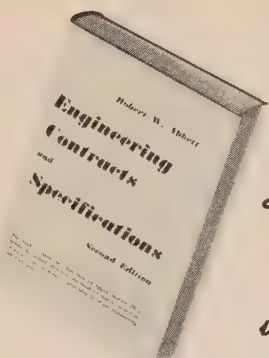
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useful tables and numerous practical examples and problems are also included. The author is well-known for his other books in the construction field and because he is outstanding in his field he needs no further recommendation.

Business, Legal, and Ethical Phases of Engineering, first edition, 1948, D. T. Canfield, M.S.E.E., E.E. Professor of Electrical Engineering, Purdue University. Member A.I.E.E. and S.P.E.E. and J. H. Bowman, M.S.E.E., E.E. Professor of Electrical Engineering, Purdue University, Member of A.I.E.E., S.P.E.E. McGraw-Hill Book Co. \$4.50.

Twenty-five chapters of material in compact form and which cannot be found elsewhere in one single volume. Part three "Business Law" is especially well treated. Chapter twenty-three contains some pithy information on patents. This reviewer has seldom seen a book that contains so much information within three hundred and fifty-eight pages. There are three appendixes on the "Unwritten Laws of Engineering, The Second Mile and sample Specifications." A book that must be in every engineer's library.

Radio Receiver Design. Part 2. Second Impression. 1948. K. R. Sturley, Ph. D., B. Sc., M.I.E.E., Scn. M.I.R.E. Head of Engineering Training Department British Broadcasting Corporation. John Wiley & Sons, Inc. \$5.50.

This volume contains a full discussion of the progressive stages involved in the design of radio receivers for FM and television reception. The author certainly packed a lot of up-to-date information into 480 pages. Radio engineers will find this book of great help. A well selected bibliography is included together with a glossary.

Distillation and Rectification, 1948. Dr. Emil Kirschbaum, Professor Karlsruhe Institute of Technology; translated by M. Wulfinhoff, Engineer Sanderson & Porter, Chemical Publishing Co. \$10.00.

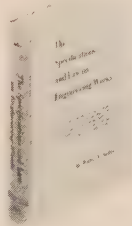
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Science Servant of Man, 1948. I. Bernard Cohen, Instructor in the History of Science and General Education, Harvard University. Little, Brown & Co. \$4.00.

A very timely and thought provoking book written by a man that knows his subject. Dr. Cohen covers science in a fascinating way which holds the readers' interest. There is nothing dry about this book, it reads like a novel and should be must reading in every home. The author is to be congratulated on the manner in which he brings understanding of science to the layman.

Forest Products Research Guide, Third Edition, 1948. National Lumber Manufacturers Association, Committee on Products and Research. \$5.00.

This guide should prove immensely valuable to engineers, chemists, etc., that are concerned with technical developments in wood and wood products. Over 8,000 forest products research projects are classified and referenced. Projects of 1,400 domestic and 700 foreign agencies are included. If you want to find out who is doing wood, etc., research and on what—the guide will furnish the answer. Easily the outstanding book of the year and the industry owes a deep debt of gratitude to the publishers.

Aluminum Alloys and Mill Products Data Book. 1948. Reynolds Metals Co., Inc. \$1.00.

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BULLETINS

Steel Products Manual. 1948. American Iron & Steel Institute. New Sections, Section 9. Cold Finished Steel Bars and Shafting. 25c.

Section 13. Cold Rolled Carbon Steel Strip. 25c.

Section 21. Concrete Reinforcing Bars. 25c.

The Frontier. Published by Kenneth K. Ash, P.O. Box 916, Yreka, California.

A western publication mainly devoted to mining—makes very interesting reading.

Investigation of Bridge Impacts with a Mechanical Oscillator. 1948. C. T. West. Engineering Experiment Station, The Ohio State University. 75c.

A well written treatise of considerable value to bridge designers and railway engineers. Chapters 6-7-8 and 9 describing the testing equipment and test procedure are excellent.

The Polarized Headlight System, Bulletin No. 11. 1948. Edwin H. Land, President and Director of Research, Polaroid Corp.; J. H. Hunt, Secy. Engineering Liaison Com. Automobile Manufacturers Assoc.; Val J. Roper, Illuminating Engineer, Lamp Dept. General Electric Co. Highway Research Board. Washington 25, D.C.

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bort. A finely crystalline form of carbon, occurring in small spherical bodies showing an internal radiating structure. Possessing the hardness of diamond, bort is exceedingly tough, and is used as the cutting agent in rock drills.

botryoidal. Like a bunch of grapes.

boule. A small pear-shaped mass of synthetic sapphire, ruby, etc., produced by the fusion of alumina, suitably tinted, in a furnace of special design.

bourbonite. An orthorhombic sulphide of lead, copper and antimony, occurring commonly in wheel-shaped twins. Called also WHEEL ORE.

bowenite. A compact, finely granular, massive form of serpentine, formerly thought to be hephrite, and used for the same purposes.

bowlingite. See saponite.

braunite. A massive, or occasionally well crystallised, cubic ore of manganese, occurring in India, New South Wales, and several European localities. Composition $3\text{Mn}_2\text{O}_3 \cdot \text{MnSiO}_3$.

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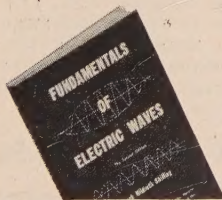
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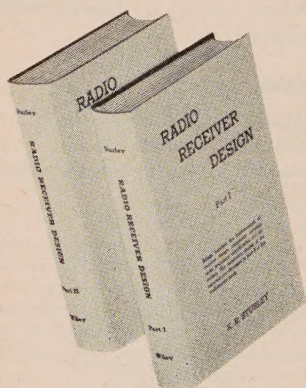
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tural Clay Products Institute, 1756 K Street, N.W., Washington 6, D.C.

Iron Lung for Industrial Buildings. 1948 catalog of the Powermatic-Ventilator Company, 4019 Prospect Avenue, Cleveland 3, Ohio.

Our National Debt and Life Insurance, No. 6 in the National Debt Series of the Committee on Public Debt Policy, 26 Liberty Street, New York 5, N.Y.

U.S. Navy Civil Engineer Corps Bulletin, 15c a copy, \$1.50 per year, order from Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C. (Published monthly.)

Columbia Engineering Quarterly, Vol. 1, No. 1, May, 1948, published by the Columbia University School of Engineering, New York 27, N.Y. Single copies 35c; three issues, \$1.00; 10 issues, \$3.00.

Bulletin No. 10, Highway Research Board, Report of Committee on Land Acquisition and Control of Highway Access and Adjacent Areas. Order from National Research Council, 2101 Constitution Ave., Washington 25, D.C.

Governmental Costs and Tax Levies, Lewis H. Kimel, The Brookings Institution, Washington, D.C. For copies write The Maurice and Laura Falk Foundation, Farmers Bank Building, Pittsburgh 22, Pa.

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Steel Products Manual, published by American Iron and Steel Institute, 350 Fifth Ave., New York 1, N.Y. Price 25c a copy. "Pig Iron and Blast Furnace Ferroalloys, Section 1" (Revised May, 1948), and "Steel Sheet Piling, Section 5" published June, 1948.

Engineering Series, Ohio State University Studies. Order from The Director, Engineering Experiment Station, The Ohio State University, Columbus 10, Ohio. Two new bulletins as follows: **Research on Flow Nozzles** by the A.S.M.E. Special Research Committee on Fluid Meters, prepared for publication by S. R. Beitler and H. S. Bean. Price, \$1.00. (Bulletin No. 131).

Investigation of Bridge Impacts with a Mechanical Oscillator, by C. T. West. Bulletin No. 132. Price, 75c.

(Editor's note: Please write directly to the publishers of pamphlets listed, rather than to A.A.E. book department, in order to avoid unnecessary delay.)

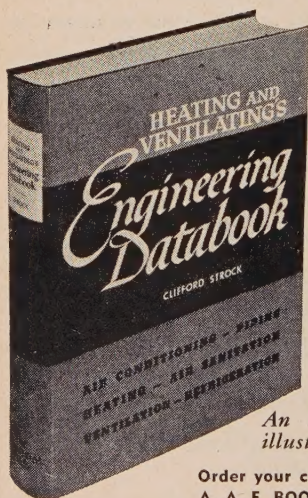
Forest Products Research Society, Proceedings of, Vol. I. Thomas R. C. Wilson, Sec.-Treas., P.O. Box 2010, University Station, Madison 5, Wis. 340 pages. \$6.00.

Incorporates papers (with discussion) presented at the first national meeting of the Society, held in Chicago, 1947. Also includes monthly bulletins of the Society, May, 1947-October, 1947, Articles and By-laws of Association, style standards, etc.

Scientific and Technical Abbreviations, Signs and Symbols, O. T. Zimmerman and Irvin Lavine. 476 pages. Industrial Research Service. 1948. \$7.50.

Thousands of signs, scientific and technical abbreviations, letter and graphical symbols in all of the important technical fields, brought together in a single volume. Arranged under headings which indicate field in which symbols, signs, etc., are used.

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